

OBSERVATIONS ON THE MORPHOLOGY OF ANCYLOSTOMA CEYLANICUM

RAJANI P. S.¹, VANITA M² & JYOTHIRMAI G. S³

¹Assistant Professor, Department of Zoology, Government Degree College for Women, Begumpet, Hyderabad, India

²Assistant Professor, Department of Education, Indira Mahindra College of Education, Mahindra University, Hyderabad, India

³Assistant Professor, Department of Zoology, Government Degree College for Women, Begumpet, Hyderabad, India

ABSTRACT

Ancylostoma ceylanicum is a round worm of the genus *Ancylostoma* causing *ancylostomiasis* in humans and other mammals. It is also called as hook worm on account of hook like appearance of *Ancylostoma*. The larval *A. ceylanicum* infests the intestine of human beings. The adult of this larval nematode, the *A. ceylanicum* is a common parasite of human beings in the tropical and sub-tropical regions causing severe anemia and general weakness. The increasing importance of the morphological examination of this parasite, had evoked the present research study. An in-depth study of the morphology of *A. ceylanicum* have been investigated in the present study. The morphological characteristic of male *A. ceylanicum* shows a characteristic funnel shaped buccal capsule and a short club-shaped oesophagus, which opens through paired valves into the long tubular intestine. A pair of long cervical glands, each with a distinct nucleus, lies just posterior to the oesophagus. The copulatory bursa is present in the males. A sharp terminal spine is present in the posterior region of the female *A. ceylanicum*. Studies of *A. ceylanicum* give crucial information of the morphological aspects of the round worm.

KEYWORDS: *Ancylostoma Ceylanicum, Hookworm, Nematode, Anemia & Subtropical Regions*

Original Article

Received: Sep 03, 2021; **Accepted:** Sep 23, 2021; **Published:** Nov 19, 2021; **Paper Id:** IJZRDEC20213

INTRODUCTION

Hookworm are round worm belonging to *Ancylostoma* genus causing *Ancylostomiasis*. Endoparasitic helminths of vertebrate host effect the host directly by absorbing the digested food and by injuring the alimentary canal. As the host is deprived of its digested food, the absorption of other nutrients is obstructed severe causing physiological changes in the host. Peters and Gilles (1977) have estimated that nearly one billion people have suffered from hookworm infection. Adult worms are white and have a hooked appearance. The infection of hookworm is generally examined from the stool samples of the host by analyzing the eggs. To distinguish different species of the hookworm, Kato-katz method and molecular techniques such as polymerase chain reaction (PCR) are often used (Sato et al., 2010). Studies on the Sequencing of ribosomal RNA gene was found to be effective and reliable. Huang et al. The peripheral blood mononuclear cell proliferation of *A. ceylanicum* was studied by Huang et a. (2020). Traub (2013) found *A. ceylanicum* infects not only humans but also other mammals like cats, dogs and golden hamsters. *A. ceylanicum* can be studied in the laboratory which infecting golden hamsters. It is also used as a test organism for the study of possible drugs to prevent hookworms in human infections. An investigation of the morphological observational studies of *A. ceylanicum* have been undertaken in the present study.

MATERIALS AND METHODS

The hookworms for the study were taken from the infected intestine of golden hamsters. The morphology of *Ancylostoma ceylanicum* was studied by flattening between two slides and fixing in 4 % formalin for a period of 24 hours, stained and morphological observations of *A. ceylanicum* were done(Pearse, 1968).

RESULTS

Morphological characteristic of *A. ceylanicum* under light microscope are given below:

- The hookworms (*A. ceylanicum*) under a light microscope.(Fig. 1,2).
- Anterior region of male *A. ceylanicum* with buccal capsule and cutting plates. (Fig. 3).
- Male *A. ceylanicum* shows copulatory bursa in the posterior region. (Fig. 4).
- Adult female *A. ceylanicum* stained with borax carmine showing anterior buccal capsule and posterior tapering end.(Fig. 5).
- Adult female *A. ceylanicum* has a spine in the posterior region.(Fig.6).

DISCUSSIONS

The hookworm *Ancylostoma*, belongs to class Nematoda which has been extensively studied morphologically. *A. ceylanicum* is found to be covered with a cuticle and a pair of cervical papillae is located near the oesophagus. The funnel shaped buccal capsule is large and has a thick wall with the absence of tubercular processes. The capsule consists of a pair of internal teeth. A short club-shaped oesophagus opens through paired valves into the long tubular intestine. Males are up to 8.1mm long and 0.36 mm(Fig. 3). Lobulated copulatory bursa surrounded the cuticle at the end of the body. The male reproductive system consists of testes, ejaculatory ducts and cloaca. A pair of long cuticularized brownish needle like spicules associated with a gubernaculum in the cloaca function in transferring seminal fluid to the female. Females are up to 10.5 mm long, 0.44 mm in width and spine is present on the tail. The vulva is present behind the middle region. The two ovaries are present. The outcome of the present studies correlated with the studies carried out by Yoshida(1967, 1971). *A. ceylanicum* has the mouth region with a sharp dorsal end and a less distinct sharp ventral end (Speare,2012).

CONCLUSIONS

Zoonotic hookworm caused of *Ancylostoma* caused great deal of harm to the organism. Eggs of different species of *Ancylostoma* are shed in the environment and often contaminate the ground. The larvae penetrate percutaneously and migrate through the skin causing inflammation and enteric infection(CDC,2012). The work by four Japanese patients of South east Asia and Papua New Guinea revealed the role of the nematode, *A. ceylanicum* in causing traveler's diarrhea(Yoshikawa et al., 2018). The most serious effect of hookworm infection was found in children and women causing in iron deficiency, anemia and hypoalbuminemia. Zoonotic hookworm species produced symptomatic infection in humans. A profound study on the morphological dimensions of *A. ceylanicum* in the present investigation reveals significant information which helps in the treatment and diagnostic studies.

ACKNOWLEDGEMENT

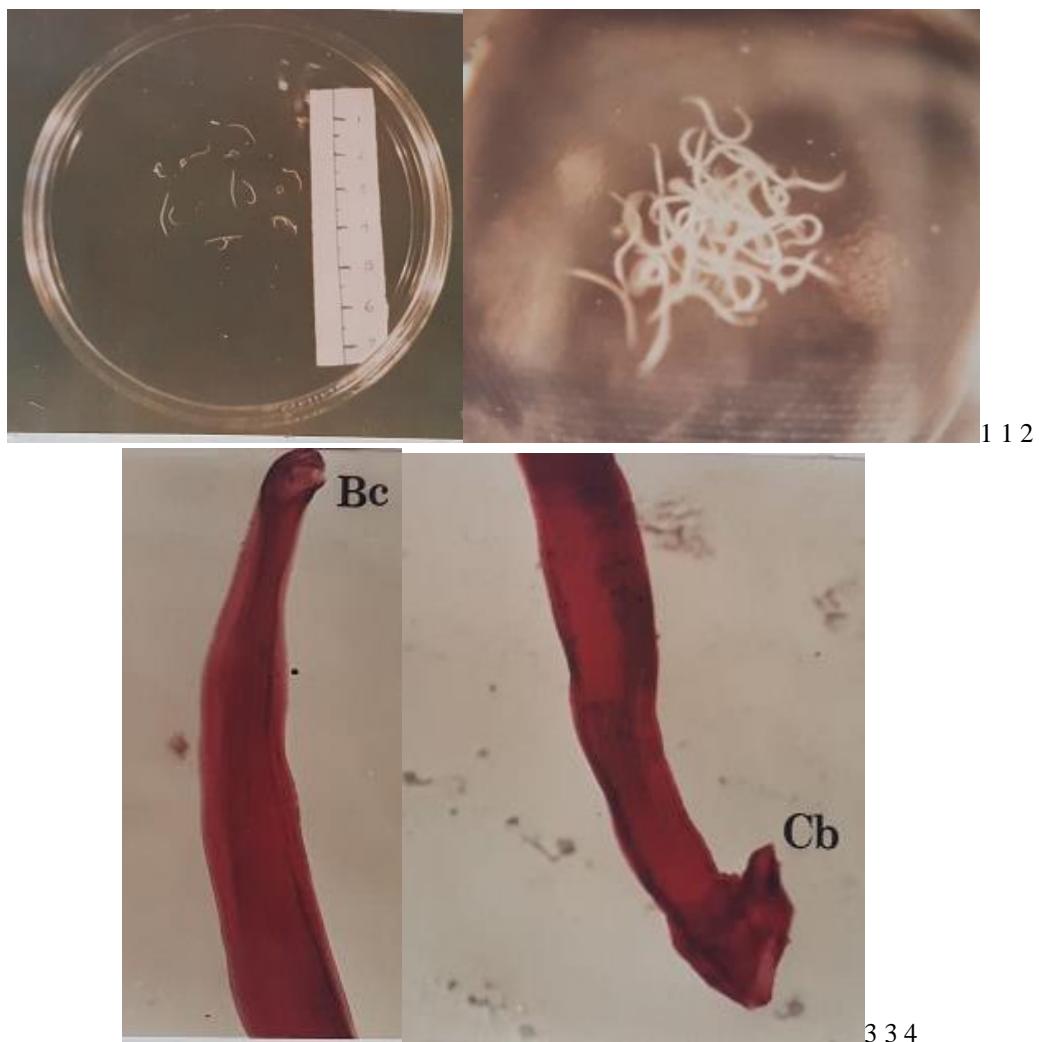
We are thankful to the Vivek Vardhini Educational Society, Jambagh, Koti for providing the laboratory facilities for the

Research work undertaken.

REFERENCES

1. M. Sato, S. Sanguankiat, T. Yoonuan, T. Pongvongsa, M. Keomoungkhoun, I. Phimmayoi, B. Boupa, K. Moji, J. Waikagul(2010). Copro-molecular identification of infections with hookworm eggs in rural Lao PDR. *Transactions of the Royal Society of Tropical Medicine and Hygiene.* 104(9):617-622
2. R. Ngu, Y.A.L. Lim, K. H. Chua (2012). Rapid detection and identification of human hookworm infections through high resolution melting(HRM) analysis. *PloS ONE.* 7(7):e41996.
3. R. J. Traub (2013). *A. ceylanicum*, a re-emerging but neglected parasitic zoonosis. *International Journal for Parasitology.* 43(12-13):1009-15.
4. Y. Yoshida(1967). Morphology, life history, pathogenicity and treatment of *A. ceylanicum* and *A. Braziliense*, DTIC Online.
5. Y. Yoshida (1971). Comparative studies on *Ancylostoma braziliense* and *Ancylostoma ceylanicum*. 1. The adult stage. *J. Parasit.* 57: 983-989.
6. R. Speare(2012). 'Taxonomy of hookworms'. *Tropical health Solutions. Tropical Health Solutions Pty. Ltd.*
7. E. M. Schwarz, Y. Hu, I. Antoshechkin, M.M. Miller, P. W. Sternberg, R. V. Aroian (2015). The genome and transcriptome of the zoonotic hookworm *A. ceylanicum* identify infection-specific gene families. *Nature Genetics.* 47 (4): 416–422.
8. J.B. Noon, E. M. Schwarz, G. R. Ostroff, R.V. Aroian(2019). A highly expressed intestinal cysteine protease of *A. ceylanicum* protects vaccinated hamsters from hookworm infection. *Nature Genetics.*
9. M. Yoshikawa, Y. Ouchi, N. Hirai, F. Nakamura-Uchiyama, M. Yamada, N. Arizono, N. Akamatsu, T. Yoh, D. Kaya, T. Nakatani, E. Kikuchi, Y. Katanami, K. Satoh, R. Maki, Y. Miyazato, Y. Oba, K. Kasahara, K. Mikasa(2018). *A. ceylanicum*, novel etiological agent for traveler's diarrhea- report of four Japanese patients who returned from Southeast Asia and Papua New Guinea. *Trop. Med Health.* 46(1): 6.
10. S. Brooker, J. Bethony, P.J. Hotez(2004). Human hookworm infection in the 21st century. *Advances in Parasitology,* 58:197-288.
11. V. Jiraanankul, W. Aphijirawat, M. Mungthin, R. Khositnithikul, R. Rangsin, R. J. Traub, P. Piyaraj, T. Naaglor, P. Taamasri, S. Leelayoova (2011). Incidence and risk factors of hookworm infection in a rural community of central Thailand. *American Journal of Tropical Medicine and Hygiene.* 84 (4): 594–598.
12. Y. C. Hsu and J. T. Lin (2012). Images in clinical medicine. Intestinal infestation with *A. ceylanicum*. *New England Journal of Medicine.* 366 (13): e20.
13. D.K. Ray, K.K. Bhopale and V.B. Shrivastava (1978). Efficacy of seven anthelmintics against *A. Ceylanicum* in the golden hamsters, *Mesocricetus auratus*. *Ann.Trop. Med. Parasitol.* 72(1):56-58.
14. Y. Huang, A.M. Abuzeid, T. Zhuang, S. Zhu, L. He, Y. Liu, O. Zhao, X. Chen and G. Li(2020). Effect of *A. ceylanicum* hookworm platelet inhibitor on platelet adhesion and peripheral blood mononuclear cell proliferation. *Parasitology Research.*
15. W. Peters and H.M. Gilles (1977). A color atlas of tropical medicine and parasitology London: Wolfe Medical publications.
16. A.G.E. Pearse(1968). *Histochemistry, theoretical and applied*, 3rd Edition, Vol.1 Churchill, London.
17. Centre for Disease Control(2012). *Parasites-Zoonotic Hookworm*.

18. Centre for Disease Control(2019). DPDx. Laboratory Identification of Parasites of public health concern-Diagnostic findings- Hookworm-Adults-*Ancylostoma ceylanicum*
19. Ali, Shahida Azhar, et al. "Poor Personal Hygiene and Socioeconomic Status Promoted Ancylostomiasis in Children Residing In Urban Areas of Lahore." *International Journal of Zoology and Research (IJZR)* 3.2, Jun 2013, 9-18
20. Lopez, J., et al. "Zn concentration influence on the structure, morphology and magnetic properties of Co (1-X) ZnxFe2O4 nanoparticles in ferrofluids." *IASET*, 6, 47 60 (2017).
21. Bhakat, Somnath, Arup Kumar Sinha, and Pradip De. "Redescription of five species of the genus *Lycodon* (Boie, 1826)(Serpents, Colubridae) on the basis of morphological variation collected from Birbhum, West Bengal, India." *Int. J. Appl. Nat. Sci* 7.2 (2018): 53-64.
22. Cynthia, S., et al. "Growth, Morphological, Optical and Physical Property Studies on Nonlinear Optical Single Crystals of MMTD." *International Journal of Applied Mathematics & Statistical Sciences (IJAMSS)* 3.3: 53-62.
23. Nadimpalli, Satish Kumar. "Sanskrit: A Vaaradhi to English Vocabulary." *International Journal of Linguistics and Literature (IJLL)* 5 (2016).





5 5 6

Morphology of *Ancylostoma ceylanicum*

Figure.1, 2.Hookworm, *Ancylostoma ceylanicum*(male and female). Figure.3.Anterior region of male *A. ceylanicum* having buccal capsule and cutting plates. Figure.4.Posterior region of male *A ceylanicum* showing 3 lobes of copulatory bursa. Figure. 5.Adult Female *A. ceylanicum* stained with borax carmine showing buccal capsule and posterior tapering end, Figure.6.Posteriorregion of female *A.ceylabucum* ending in a spine. Copulatory bursa-Cb. Spine- Sp, Buccal Capsule-Bc.

